Gasoline Cargo Tank

Test Procedures

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USE OF THE PROCEDURES

Overview

The state regulation Chapter 173-491-040(6) WAC, Emission Standards and Controls for Sources Emitting Gasoline Vapors, requires owners of gasoline transport trucks to annually test cargo tanks for vapor leaks. These regulations require the Department of Ecology to approve test procedures: (a) for determining compliance with this section and (b) for confirming continuing leak tight conditions for gasoline vapor, i.e. vapor- tightness.

This document specifies the procedures and criteria approved by the Department of Ecology for testing gasoline cargo tanks. These procedures must be followed by all cargo tank testers that certify vapor-tightness of tanks used in Washington.

Copies of the procedures, criteria and form can also be downloaded from the Ecology website at http://www.wa.gov/ecology.

Section 1: Procedures

Method 27 - Determination of Vapor Tightness of Gasoline Delivery Tanks

The Ecology approved procedure for testing gasoline cargo tanks for vapor-tightness is specified in 40 CFR Part 60, Appendix A, Method 27.

Section 2: Criteria

Allowable Test Pressures or Vacuum Changes

The Ecology approved criteria for the allowable cargo tank test pressure or vacuum changes for determining gasoline cargo tank vapor-tightness are specified in 40 CFR 63.425(e).

Section 3: Reporting Form

Gasoline Cargo Tank Annual Certification Form

This document is the approved Ecology form for certifying gasoline cargo tank vapor-tightness. Completed certifications specifying the test used and the results for each transport tank must be on file with each gasoline loading terminal or facility where gasoline is transferred. To be a valid certificate of tank vapor-tightness, the certification must be signed by a tester who has followed the procedures in this document. Testers who accurately use the specified tests and criteria are considered approved by the Department of Ecology.

Section 1: Procedures

Method 27 - Determination of Vapor Tightness of Gasoline Cargo Tanks 40 CFR Part 60, Appendix A

Applicability and Principle

1.1 Applicability. This method is applicable for the determination of vapor tightness of a gasoline delivery tank which is equipped with vapor collection equipment.
1.2 Principle. Pressure and vacuum are applied alternately to the compartments of a gasoline delivery tank and the change in pressure or vacuum is recorded after a specified period of time.

2. Definitions and Nomenclature

2.1 Gasoline. Any petroleum distillate or petroleum distillate/alcohol blend having a Reid vapor pressure of 27.6 kilopascals (4 psi) or greater which is used as a fuel for internal combustion engines.

2.2 Delivery Tank. Any container, including associated pipes and fittings, that is attached to or forms a part of any truck, trailer, or railcar used for the transport of gasoline.

2.3 Compartment. A liquid-tight division of a delivery tank.

2.4 Delivery Tank Vapor Collection Equipment. Any piping, hoses, and devices on the delivery tank used to collect and route gasoline vapors either from the tank to a bulk terminal vapor control system or from a bulk plant or service station into the tank.

2.5 Time Period of the Pressure or Vacuum Test (t). The time period of the test, as specified in the appropriate regulation, during which the change in pressure or vacuum is monitored, in minutes.

2.6 Initial Pressure (P_i). The pressure applied to the delivery tank at the beginning of the static pressure test, as specified in the appropriate regulation, in mm H_2O (in. H_2O).

2.7 Initial Vacuum (V_i). The vacuum applied to the delivery tank at the beginning of the static vacuum test, as specified in the appropriate regulation, in mm H_2O (in. H_2O).

2.8 Allowable Pressure Change (Δ p). The allowable amount of decrease in pressure during the static pressure test, within the time period t, as specified in the appropriate regulation, in mm H_2O (in. H_2O).

2.9 Allowable Vacuum Change (Δv). The allowable amount of decrease in vacuum during the static vacuum test, within the time period t, as specified in the appropriate regulation, in mm H_2O (in. H_2O).

3. Apparatus

3.1 Pressure Source. Pump or compressed gas cylinder of air or inert gas sufficient to pressurize the delivery tank to 500 mm H_2O (20 in. H_2O) above atmospheric pressure.

3.2 Regulator. Low pressure regulator for controlling pressurization of the delivery tank.

3.3 Vacuum Source. Vacuum pump capable of evacuating the delivery tank to 250 mm H_2O (10 in. H_2O) below atmospheric pressure.

3.4 Pressure-Vacuum Supply Hose.

3.5 Manometer. Liquid manometer, or equivalent instrument, capable of measuring up to 500 mm H_2O gauge pressure with ± 2.5 mm H_2O (0.1 in. H_2O) precision.

3.6 Pressure-Vacuum Relief Valves. The test apparatus shall be equipped with an inline pressure-vacuum relief valve set to activate at 675 mm H_2O (26.5 in. H_2O) above atmospheric pressure or 250 mm H_2O (10 in. H_2O) below atmospheric pressure, with a capacity equal to the pressurizing or evacuating pumps.

3.7 Test Cap for Vapor Recovery Hose. This cap shall have a tap for manometer connection and a fitting with shut-off valve for connection to the pressure-vacuum supply hose.

3.8 Caps for Liquid Delivery Hoses.

4. Pretest Preparations

4.1 Summary. Testing problems may occur due to the presence of volatile vapors and/or temperature fluctuations inside the delivery tank. Under these conditions, it is often difficult to obtain a stable initial pressure at the beginning of a test, and erroneous test results may occur. To help prevent this, it is recommended that prior to testing, volatile vapors be removed from the tank and the temperature inside the tank be allowed to
stabilize. Because it is not always possible to attain completely these pretest conditions a provision to ensure reproducible results is included. The difference in results for two consecutive runs must meet the criterion in Sections 5.2.5 and 5.3.5.

4.2 Emptying of Tank. The delivery tank shall be emptied of all liquid.

4.3 Purging of Vapor. As much as possible the delivery tank shall be purged of all volatile vapors by any safe, acceptable method. One method is to carry a load of non-volatile liquid fuel, such as diesel or heating oil, immediately prior to the test, thus flushing out all the volatile gasoline vapors. A second method is to remove the volatile vapors by blowing ambient air into each tank compartment for at least 20 minutes. This second method is usually not as effective and often causes stabilization problems, requiring a much longer time for stabilization during the testing.

4.4 Temperature Stabilization. As much as possible, the test shall be conducted under isothermal conditions. The temperature of the delivery tank should be allowed to equilibrate in the test environment. During the test, the tank should be protected from
extreme environmental and temperature variability, such as direct sunlight.

5. Test Procedure

5.1 Preparations.

5.1.1 Open and close each dome cover.

5.1.2 Connect static electrical ground connections to tank.
Attach the liquid delivery and vapor return hoses, remove the liquid delivery elbows, and plug the liquid delivery fittings.[1]

5.1.3 Attach the test cap to the end of the vapor recovery hose.

5.1.4 Connect the pressure-vacuum supply hose and the pressure-vacuum relief valve to the shut-off valve. Attach a manometer to the pressure tap.

5.1.5 Connect compartments of the tank internally to each other if possible. If not possible, each compartment must be tested separately, as if it were an individual delivery tank.

5.2 Pressure Test.

5.2.1 Connect the pressure source to the pressure-vacuum supply hose.

5.2.2 Open the shut-off valve in the vapor recovery hose cap. Apply air pressure slowly, pressurize the tank to P_i, the initial pressure specified in the regulation.

5.2.3 Close the shut-off and allow the pressure in the tank to stabilize, adjusting the pressure if necessary to maintain pressure of P_i. When the pressure stabilizes, record the time and initial pressure.

5.2.4 At the end of t minutes, record the time and final pressure.

[1] The purpose of testing the liquid delivery hoses is to detect tears or holes that would allow liquid leakage during a delivery. Liquid delivery hoses are not considered to be possible sources of vapor leakage, and thus, do not have to be attached for a vapor leakage test. Instead, a liquid delivery hose could be either visually inspected, or filled with water to detect any liquid leakage.

5.2.5 Repeat steps 5.2.2 through 5.2.4 until the change in pressure for two consecutive runs agrees within ± 12.5 mm H_2O (0.5 in. H_2O). Calculate the arithmetic average of the two results.

5.2.6 Compare the average measured change in pressure to the allowable pressure change, Δp, as specified in the regulation. If the delivery tank does not satisfy the vapor tightness criterion specified in the regulation, repair the sources of leakage, and repeat the pressure test until the criterion is met.

5.2.7 Disconnect the pressure source from the pressure-vacuum supply hose, and slowly open the shut-off valve to bring the tank to atmospheric pressure.

5.3 Vacuum Test.

5.3.1 Connect the vacuum source to the pressure-vacuum supply hose.

5.3.2 Open the shut-off valve in the vapor recovery hose cap.
Slowly evacuate the tank to V_i , the initial vacuum specified in the regulation.

5.3.3 Close the shut-off valve and allow the pressure in the tank to stabilize, adjusting the pressure if necessary to maintain a vacuum of V_i. When the pressure stabilizes, record the time and initial vacuum.

5.3.4 At the end of t minutes, record the time and final vacuum.

5.3.5 Repeat steps 5.3.2 through 5.3.4 until the change in vacuum for two consecutive runs agrees within ± 12.5 mm H_2O (0.5 in. H_2O) Calculate the arithmetic average of the two results.

5.3.6 Compare the average measured change in vacuum to the allowable vacuum change, Δv, as specified in the regulation. If the delivery tank does not satisfy the vapor tightness criterion specified in the regulation, repair the sources of leakage, and repeat the vacuum test until the criterion is met.

5.3.7 Disconnect the vacuum source from the pressure-vacuum supply hose, and slowly open the shut-off valve to bring the tank to atmospheric pressure.

5.4 Post-Test Clean-up. Disconnect all test equipment and return the delivery tank to its pretest condition.

6. Alternative Procedures

6.1 The pumping of water into the bottom of a delivery tank is an acceptable alternative to the pressure source described above. Likewise, the draining of water out of the bottom of a delivery tank may be substituted for the vacuum source. Note that some of the specific step-by-step procedures in the method must be altered slightly to accommodate these different pressure and vacuum sources.

6.2 Techniques other than specified above may be used for purging and pressurizing a delivery tank, if prior approval is obtained from the U.S. Environmental Protection Agency Administrator. Such approval will be based upon demonstrated equivalency with the above method.

Section 2: Criteria

Allowable Test Pressures or Vacuum Changes
40 CFR 63.425(e)

Cargo Tank Tests

(e) Annual certification test. The annual certification test for gasoline cargo tanks shall consist of the following test methods and procedures:

(1) Method 27, Appendix A, 40 CFR part 60. Conduct the test using a time period (t) for the pressure and vacuum tests of 5 minutes. The initial pressure (P_i) for the pressure test shall be 460 mm H_2O (18 in. H_2O), gauge. The initial vacuum (V_i) for the vacuum test shall be 150 mm H_2O (6 in. H_2O), gauge. The maximum allowable pressure and vacuum changes (Δp, Δv) are as shown in the second column of Table 2 of this paragraph.

Table 2--Allowable Cargo Tank Test Pressure or Vacuum Change

Cargo tank or compartment capacity, liters (gal)	Annual certification-Allowable pressure , Δp, or vacuum change, Δv, in 5 minutes, mm H_2O (in. H_2O)	Allowable Pressure change (Δp) in 5 minutes, at any time, mm H_2O (in. H_2O)
9,464 or more (2,500 or more).....	25 (1.0)	64 (2.5)
9,463 to 5,678 (2,499 to 1,500).....	38 (1.5)	76 (3.0)
5,679 to 3,785 (1,499 to 1,000).....	51 (2.0)	89 (3.5)
3,782 or less (999 or less).....	64 (2.5)	102 (4.0)

Tank Internal Vapor Valve Test

(2) Pressure test of the cargo tank's internal vapor valve as follows:

(i) After completing the tanker truck test above, use the procedures in Method 27 to repressurize the tank to 460 mm H_2O (18 in. H_2O), gauge. Close the tank's internal vapor valve(s), thereby isolating the vapor return line and manifold from the tank.

(ii) Relieve the pressure in the vapor return line to atmospheric pressure, then reseal the line. After 5 minutes, record the gauge pressure in the vapor return line and manifold. The maximum allowable 5-minute pressure increase is 130 mm H_2O (5 in. H_2O).

Section 3: Reporting Form
Gasoline Cargo Tank Annual Certification

Please Note:

Copies of this form can be downloaded from the Ecology website at:
http://www.wa.gov/ecology

Forms that are downloaded can be filled out electronically and saved on a computer file.

GASOLINE CARGO TANK ANNUAL CERTIFICATION

CARGO TANK OWNER: _____

ADDRESS: _____

CITY: _____

TANK ID #: _____

TANK SERIAL #: _____

DOT SPECIFICATION #: _____

TESTING COMPANY: _____

ADDRESS: _____

CITY: _____

TESTER'S NAME: _____

TITLE: _____

SIGNATURE: _____

TEST DATE: _____

Internal Vapor Valve Test - 40 CFR 63.425(e)(2)

After completing the pressure decay and vacuum tests, use the procedures in Method 27 to repressurize the tank to 18 inches H_2O gauge. Close the tank's internal vapor valve(s), thereby isolating the vapor return line and manifold from the tank. Relieve all the pressure in the vapor return line to atmospheric pressure, then reseal the line. After 5 minutes, record the gauge pressure in the vapor return line.

	Initial Pressure (inches H_2O)	Final Pressure (inches H_2O)	Pressure Increase
1st test:			
2nd test (if repairs are necessary):			

PASS:

YES

Allowable Limit: 5 inches H_2O

NO ☐ (check one)

Vapor tightness repair (if any) - nature of repair work and when performed in relation to the test:

Method 27 - 40 CFR Part 60, Appendix A

Pressure Decay Test - 40 CFR 63.425(e)(1) Conduct the test using a time period of 5 minutes. The initial pressure shall be 18 inches H_2O, gauge.

ECY 020-116 (9/99)

	Capacity (gallons)	Initial Pressure (inches H_2O)	Final Pressure (inches H_2O)	Pressure Decay
1st test:				
2nd test:				
3rd test (if repairs are necessary):				
Average of the 2 tests with pressure decay within 0.5 inches H_2O of each other				

PASS: **YES** ☐

NO ☐ (check one)

Allowable Limits:

Capacity (gal)	Decay
> 2,499	1.0"
1,500 to 2,499	1.5"
1,499 to 1,000	2.0"
< 1,000	2.5"

Vapor tightness repair (if any) - nature of repair work and when performed in relation to the test:

Vacuum Decay Test - 40 CFR 63.425(e)(1) Conduct the test using a time period of 5 minutes. The initial vacuum shall be 6 inches H_2O, gauge.

	Capacity (gallons)	Initial Vacuum (inches H_2O)	Final Vacuum (inches H_2O)	Vacuum Decay
1st test:				
2nd test:				
3rd test (if repairs are necessary):				
Average of the 2 tests with vacuum decay within 0.5 inches H_2O of each other				

PASS: **YES** ☐

NO ☐ (check one)

Allowable Limits:

Capacity (gal)	Decay
> 2,499	1.0"
1,500 to 2,499	1.5"
1,499 to 1,000	2.0"
< 1,000	2.5"

Vapor tightness repair (if any) - nature of repair work and when performed in relation to the test: